

July 11, 2001 and further extended to September 11, 2001 by the Notice of Appeal filed on July 11, 2001, Applicants respectfully submit the following amendments and remarks in support of the patentability of the claims.

IN THE CLAIMS:

Please cancel Claims 38 and 54 without prejudice to or disclaimer of the subject matter contained therein.

Please amend Claims 1, 4, 14, 17, 21, 25, 27, 30, 33, 37, 39, 43, 45, 53, 55, 58, 61, 63 and 74 as follows. A marked-up version of these claims, showing the changes made thereto, is attached.

J¹

1. (Twice Amended) ink-jet recording apparatus for forming an image on a recording medium comprising a plurality of ink discharge means and a plurality of ink discharge openings and containing a plurality of inks, wherein the plurality of inks is discharged from the plurality of ink discharge openings by driving the ink discharge means, each ink having a penetrability, a dye density and a color;

cont'd
J1

said plural ink discharge openings corresponding to a plurality of inks with different dye densities, wherein the penetrabilities of inks having different dye densities and same colors are different from each other and ink having low dye density among the plurality of inks of different dye densities and same colors has more penetrability with respect to the recording medium than ink having high dye density;

and wherein said plurality of inks contain different component ratios of a surfactant, wherein an ink having a relatively high dye density has a lower component ratio of said surfactant than an ink having a relatively low dye density,

said apparatus further comprising control means for performing gradational recording by controlling discharge of each of the plurality of inks with different dye densities based on inputted image data, the image data being data representing a density level,

wherein said control means controls recording so that recording is performed by mainly using ink having low dye density when the density level represented by the image data is relatively low and recording is performed by mainly

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J1

using ink having high dye density when the density level represented by the image data is relatively high.

J2

~~24~~. (Amended) The ink-jet recording apparatus according to claim 1, wherein said plural inks consist of the first ink with a relatively high dye density in ink and the second ink with a relatively low dye density in ink in comparison with the first ink, said first ink containing no surfactant in a composition thereof, while said second ink contains said surfactant in a composition thereof.

J3

¹²~~14~~. (Twice Amended) An ink-jet recording method for forming an image on a recording medium comprising the steps of:

providing a plurality of inks, each having a penetrability, a dye density and a color;

providing a recording medium;

providing a plurality of ink discharge openings and a plurality of ink discharge means;

Contd
J³

discharging onto the recording medium the plurality of inks from the plurality of ink discharge openings by driving the ink discharge means;

said plurality of ink discharge openings corresponding to a plurality of inks with different dye densities, wherein the penetrabilities of inks having different dye densities and same colors are different from each other, and ink having low dye density among the plurality of inks of different dye densities and same colors has more penetrability with respect to the recording medium than ink having high dye density;

wherein said plurality of inks contain different component ratios of a surfactant, wherein an ink having a relatively high dye density has a lower component ratio of said surfactant than an ink having a relatively low dye density;

performing gradational recording by controlling discharge of each of the plurality of inks with different dye densities based on inputted image data, the image data being data representing a density level,

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J3

wherein discharge is controlled so that recording is performed by mainly using ink having low dye density when the density level represented by the image data is relatively low and recording is performed by mainly using ink having high dye density when the density level represented by the image data is relatively high.

J4

~~13~~
~~17~~

(Amended) The ink-jet recording method according to claim ~~14~~¹², wherein said plural inks consist of the first ink with a relatively high dye density in ink and the second ink with a relatively low dye density in ink in comparison with the first ink, said first ink containing no surfactant in a composition thereof, while said second ink contains said surfactant in a composition thereof.

J5

~~17~~
~~21~~

(Twice Amended) An ink-jet recording apparatus, comprising a recording head equipped with a plurality of ink discharge means, and a plurality of discharge ports and containing a plurality of inks, wherein the plural discharge ports of said recording head are comprised of a plurality of discharge port trains

Cont'd
JS

corresponding to the plurality of inks, wherein the plurality of inks is discharged onto a recording medium to form an image, each of the plurality of inks having a penetrability, a color and a different dye density, wherein the penetrabilities of inks having different dye densities and same colors are different from each other and ink having low dye density among the plurality of inks of different dye densities and same colors has more penetrability with respect to the recording medium than ink having high dye density;

and wherein said plurality of inks contain different component ratios of a surfactant, wherein an ink having a relatively high dye density has a lower component ratio of said surfactant than an ink having a relatively low dye density,

said apparatus further comprising control means for performing gradational recording by controlling discharge of each of the plurality of inks with different dye densities based on inputted image data, the image data being data representing a density level,

wherein said control means controls recording so that recording is performed by mainly using ink having low

Contd
J5

dye density when the density level represented by the image data is relatively low and recording is performed by mainly using ink having high dye density when the density level represented by the image data is relatively high.

J6

¹⁹
~~25~~. (Amended) The ink-jet recording apparatus according to claim ¹⁷~~21~~, wherein said plural inks with different dye densities in ink consist of the first ink with a relatively high dye density in ink and the second ink with a relatively low dye density in ink in comparison with the first ink, said first ink containing no surfactant in a composition thereof, while said second ink contains said surfactant in a composition thereof.

J7

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~~27~~. (Amended) The ink-jet recording apparatus according to claim ²⁰~~26~~, further comprising a distribution means which divides entered data as recording data for said plural inks with different dye densities in inks in accordance with a gradation indicated by an inputted image signal.

24
30. (Amended) An ink-jet recording apparatus,

J8
comprising a plurality of recording heads equipped with a plurality of ink discharge means and a plurality of discharge ports and containing a plurality of inks, wherein said plural recording heads correspond to the plurality of inks, each ink having a penetrability, a color and a different dye density, wherein the plurality of inks is discharged onto a recording medium to form an image, and wherein the penetrabilities of inks having different dye densities and same colors are different from each other and ink having low dye density among the plurality of inks of different dye densities and same colors has more penetrability with respect to the recording medium than ink having high dye density;

and wherein said plurality of inks contain different component ratios of a surfactant, wherein an ink having a relatively high dye density has a lower component ratio of said surfactant than an ink having a relatively low dye density,

said apparatus further comprising control means for performing gradational recording by controlling discharge of each of the plurality of inks with different dye densities

Cont'd
J8

based on inputted image data, the image data being data representing a density level,

wherein said control means controls recording so that recording is performed by mainly using ink having low dye density when the density level represented by the image data is relatively low and recording is performed by mainly using ink having high dye density when the density level represented by the image data is relatively high.

J9

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33. (Amended) The ink-jet recording apparatus according to claim ²⁴30, wherein said plural inks with different dye densities in ink consist of the first ink with a relatively high dye density in ink and the second ink with a relatively low dye density in ink in comparison with the first ink, said first ink containing no surfactant in a composition thereof, while said second ink contains said surfactant in a composition thereof.

J10

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37. (Amended) An ink-jet recording apparatus which forms an image on a recording medium by using a plurality of ink discharge means discharging a plurality of inks, wherein said plural ink discharge means correspond to the plurality

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J10

of inks, the plurality of inks are inks having different dye densities with respect to a plurality of colors, the plurality of inks are contained in a plurality of ink containers and each of the plurality of ink containers corresponds to a different color of ink, each of the ink containers containing a plurality of inks having different dye densities of a same color series.

38. Cancelled.

J11

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38. (Amended) The ink-jet recording apparatus according to claim ²⁸37, wherein said plural inks having different dye densities in ink are held in said ink containers, the volume of each of said inks being different.

J12

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43. (Amended) The ink-jet recording apparatus according to claim ³¹41, wherein said plural inks with different dye densities in ink consists of the first ink with a relatively high dye density in ink and the second ink with a relatively low dye density in ink in comparison with the first ink, said first ink containing no surfactant in a

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J12

composition thereof, while said second ink containing said surfactant in a composition thereof.

J13

³⁵
45. (Amended) The ink-jet recording apparatus according to claim ³⁴44, further comprising a distribution means which divides entered data as recording data for said plural inks with different dye densities in inks in accordance with a gradation indicated by an inputted image signal.

J14

⁴³
53. (Amended) An ink-jet recording apparatus, containing a plurality of inks and comprising a plurality of recording heads equipped with a plurality of ink discharge means, which discharge ink through discharge ports, and forming an image on a recording medium by discharging the ink through a plurality of discharge ports of said recording heads, wherein said plural recording heads correspond to the plurality of inks, the plurality of inks are inks having different dye densities with respect to a plurality of colors, the plurality of inks are contained in a plurality of ink containers and each of the plurality of ink containers corresponds to a different color of ink, each of the ink

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J14

containers containing a plurality of inks having different dye densities of a same color series.

54. Cancelled.

J15

⁴⁴
55. (Amended) The ink-jet recording apparatus according to claim ⁴³53, wherein said plural inks having different dye densities in ink are held in said ink containers, the volume of each of said inks being different.

J16

⁴⁷
58. (Amended) The ink-jet recording apparatus according to claim ⁴⁶57, further comprising a distribution means which divides entered data as recording data for said plural inks with different dye densities in inks in accordance with a gradation indicated by an inputted image signal.

J17

⁵⁰
61. (Amended) An ink-jet recording apparatus containing a plurality of inks and comprising a plurality of recording heads equipped with a plurality of ink discharge means for discharging inks and forming an image on a

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J17

recording medium by discharging the inks from a plurality of discharge ports of said recording heads, wherein said plural recording heads correspond to the plurality of inks having different color materials, the plural discharge ports of said recording heads comprising a plurality of discharge port trains corresponding to the plural inks having different dye densities, the plurality of inks are inks having different dye densities with respect to a plurality of colors, the plurality of inks are contained in a plurality of ink containers and each of the plurality of ink containers corresponds to a different color of ink, each of the ink containers containing a plurality of inks having different dye densities of a same color series.

J18

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63. (Amended) An ink-jet recording apparatus for recording by discharging a plurality of inks having different densities of a same color series for use with an ink-jet head for discharging ink, comprising:

a recording control means for recording by discharging a plurality of inks having different densities of a same color series by said ink-jet head, wherein the recording control means controls discharge of each of said

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J18

plurality of inks in accordance with a level represented by input image data,

wherein each of said plurality of inks having different densities of the same series of color contains a different amount of surfactant for enhancing penetrability with respect to a recording medium, such that an ink having a low density contains a greater amount of said surfactant than an ink having a high density, and

wherein said recording control means controls recording with a plurality of inks having different densities so that recording is performed by mainly using ink having low density when the image data is a low level and recording is performed by mainly using ink having high density when the image data is a high level.

J19

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74.

(Amended) An ink-jet recording method for recording by discharging a plurality of inks having different densities of a same color series for use with an ink-jet head for discharging ink, comprising the steps of:

inputting image data representing a density level;

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J19

generating data for discharging ink, corresponding to each of a plurality of inks having different densities of a same color series in accordance with said image data; and

recording by discharging ink based on said generated data,

wherein each of said plurality of inks having different densities of the same color series contains a different amount of surfactant for enhancing penetrability with respect to a recording medium, such that an ink having a low density contains a greater amount of said surfactant than an ink having a high density, and

wherein recording is performed with a plurality of inks and by mainly using ink having low density when the image data is a low level and mainly using ink having high density when the image data is a high level.

REMARKS

Reconsideration and allowance of this application are respectfully requested.

Status of the Claims